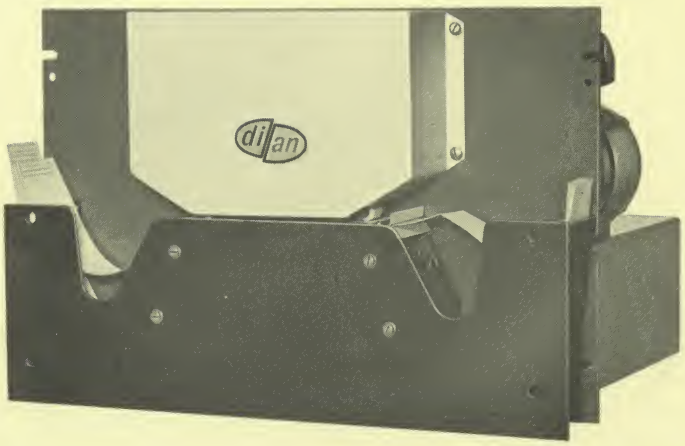


SERIES DL LISTER/PRINTER

BULLETIN 4-200

INTRODUCTION

The Series DL is a new, low-cost, high-speed lister/printer designed primarily for data logging applications. It is capable of speeds up to 40 numeric lines per second or 20 alphanumeric lines per second, with line widths expandable in 4-column increments up to 16 columns. A smaller version of the Series N Lister/Printer, the Series DL permits easy and exact integration to virtually any digital data source, and provides reliable performance with simplified maintenance. The Series DL uses a continuous, rotating type-drum which is cantilevered beyond the front panel. Paper passes from the feed bin on the right, through the print mechanism, to the take-up bin on the left. The type-drum is mounted above the paper with the two part hammers mounted below. Motor, timing circuits, logic circuits and power supply are all located behind the front panel. Features incorporated into the Series DL include a long-life self-saturated inking roller, electronic print adjustment, interchangeable code wheels, modular construction, versatile interfacing and many useful options.

FEATURES

ECONOMY

In addition to the low initial purchase price, the Series DL offers low operating and maintenance costs. The exclusive inking roller alone, which has ten times the inking capacity of a ribbon, provides operating cost-savings of up to $0.75 per hour. Both the frequency of, and the time required for, adjustment are drastically cut with the Series DL compared to printers that require mechanical adjustment of the vertical alignment. And routine maintenance is facilitated by complete and easy accessibility of all major functional parts. Only two minutes are required, for example, to replace a hammer module.

RELIABILITY

The main frame of the Series DL has only six moving parts. These include four rotating members, one of which is the inking roller; and the printing mechanism has only two moving parts per column. All bearings are sealed and self-lubricating. Hammer modules have been cycled for 100,000,000 operations without failure or adjustment, and the all-silicon circuits have an average calculated MTBF of 3500 hours (MIL-HBK-217).

FLEXIBILITY

Series DL Lister/Printers provide full modular flexibility in column capacity, interface electronics, control arrangements and optional features. A choice of four different type-drums and four input data interface circuits, with optional line storage and input gates, is available. The printer can be operated and/or controlled either synchronously or asynchronously with the data source. Character entry can be easily accommodated, and a manual and remote paper advance is provided on every unit. In addition, interchangeable code wheels allow the Series DL Lister/Printer to be adapted to any input code.

LOW MAINTENANCE

Modular construction of both mechanical and electrical components has been used throughout to simplify routine maintenance and replacement of parts. Dust covers can be removed easily to expose all the operating mechanisms. Printing elements are self-cleaning, and electronic adjustment of the vertical alignment reduces the time for the most complex adjustment to less than five minutes.

PRINT QUALITY

The combination of unique features which have been designed into the Series DL Lister/Printer provides printout of exceptionally clear definition and registration, even at maximum speeds. Copy is always readable and approaches graphic arts quality — the result of a simplified design which has evolved from years of high-speed printer development experience.

APPLICATIONS

1. Data Logging **2.** Data Acquisition **3.** High-Speed Listing **4.** Data Phone Link Printout **5.** Automatic Checking **6.** Ground Checkout Systems **7.** Addressing **8.** Computer Output Printing **9.** Experimental Printing **10.** Computer Program Checkout

OPTIONS

• Line storage with input gates • Four data input circuits • Zero suppression • Remotely operated input gates for character serial inputs • Inkless impact-sensitive paper • Non-standard type fonts

PERFORMANCE SPECIFICATIONS

Printing Speeds

Numeric . . . up to 2400 lines per minute, asynchronous operation

Alphanumeric . . . up to 1200 lines per minute

Column Capacity . . . up to 16 columns, in 4-column increments

Print Spacing

Column . . . 10 columns per inch

Line . . . . . 6 lines per inch

Printing Medium

Inking . . . long-life, self-saturated inking roller

Non-inking . . 3M "ACTION PAPER"

Paper . . . . . 1000 sheets, fan-folded, 2½" wide

Power . . . . . 115/230 VAC, 47 to 63 cps, 300 watts max.

Number of Characters

Numeric: 15 characters plus blank at 40 lps, asynchronous operation

Alphanumeric: 48 characters plus blank at 20 lps.

Input Codes . . . any binary character or BCD code, positive or negative true

Manual Controls

Off . . . . . power off

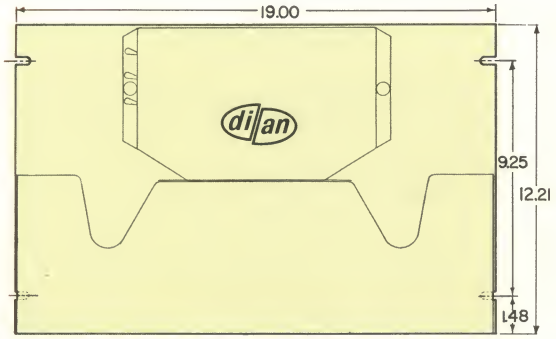
Standby power on but not printing (lamp indicator)

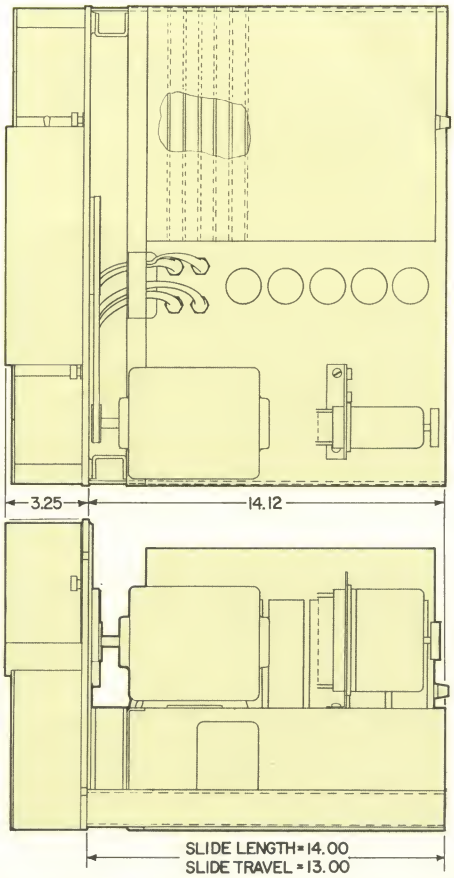
Operate . . . . . for printing on-line (lamp indicator)

Paper Advance . . . advances paper without printing

MECHANICAL SPECIFICATIONS

Installation of a Series DL in a standard 19" relay rack requires 13" of panel height. It extends 14" behind the panel and 3" in front. Weight of the Series DL Lister/Printer, with integrated power supply, is 75 pounds.





INTERFACE SPECIFICATIONS

Electrical and logical interface specifications are presented in Bulletin 4-300.

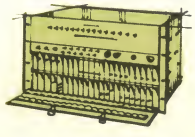
PRICE The price of the Series DL Lister/Printer ranges between $2500 and $5,000 depending on the number of columns and the options required.

Di/An Controls, Inc.

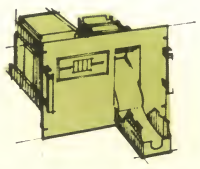
944 Dorchester Avenue, Boston, Massachusetts 02125

Phone: (617) 288-7700 TWX: 710-333-0174

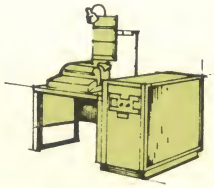
Digital Magnetic Modules and Cards for Logic and Control.



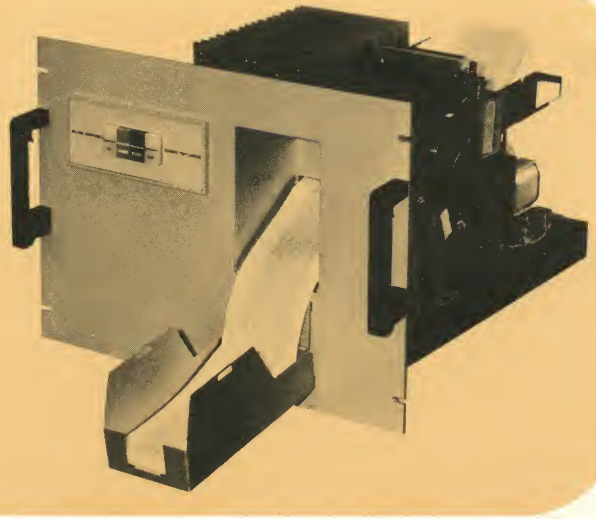
Magnetic Core Memories for aerospace, terrestrial and hydrospace applications



Digital Lister/Printers for data logging



Computer Keyboards for composing-room typesetting



SERIES N LISTER/PRINTER

BULLETIN 4-102

INTRODUCTION

The increasing demands placed on today's data acquisition and processing systems have created new requirements for reliable high-speed printing equipment. This is particularly true in the areas of data logging, listing, automatic test printing, and special computer output printing where clear, readable copy is absolutely necessary. To meet these requirements, DI/AN Controls, Inc. has developed a 32-column capacity series of high-speed lister printers — Series N — capable of producing up to 2400 lines of high quality numeric print out every minute or 1200 alphanumeric lines.

FEATURES

ECONOMY

The initial cost is low, since the mechanical and electronic flexibility of the Series N Lister Printer with its complete inventory of optional features permits easy and exact integration to virtually any digital data source. And, the initial investment is repaid many times in lower operating and maintenance cost. An exclusive inking roller, which has ten times the inking capacity of a ribbon, will save $.50 to $.75 per operating hour over troublesome ribbons. This savings alone will pay for maintenance of the machine and will eventually pay off its initial cost.

RELIABILITY

A highly reliable mechanical system is guaranteed by a through-hardened steel print drum supported at both ends, a printing mechanism with only two moving parts per column and elimination of ribbon drive and reversing mechanism. The low mass printing element has undergone — without failure — over 100,000,000 firings, and, as this element is softer than the type drum, the type drum should never wear out. The associated all-silicon circuits have an average calculated MTBF of 3500 hours (MIL-H-BK-217).

LOW MAINTENANCE

Modular construction has been used throughout to simplify maintenance or replacement of parts. Printing elements are self-cleaning. Electronic adjustment of the vertical alignment reduces the time for the most complex adjustment to less than five minutes. The entire mechanical printer can be opened while operating so the entire machine, including the hammer modules, is exposed and accessible.

PRINT QUALITY

The combination of features designed into the Series N Lister Printer gives its printout exceptionally clear definition and registration even at maximum speeds. Copy is always readable even by commercial optical readers. This print quality is the result of a simplified design that has evolved from years of high-speed printer development experience.

FLEXIBILITY

Series N Lister Printers provide full modular flexibility: In column capacity, interface electronics, optional features and cabinet configuration. The Series N can be made expandable in increments of 4 columns through 32 columns without sending it back to the factory for modification. A choice of 4 input data interface circuits is available, along with input storage and input data formatting circuits for character serial or bit serial inputs. Synchronous or asynchronous control is available on all modules. A replaceable code wheel allows the machine to be adapted to any input code. These features and others make the Series N Lister Printer easily adaptable to any small or medium-scale digital printing operation and virtually any digital data source.

APPLICATIONS

1. High-Speed Listing **2.** Data Acquisition **3.** Data Logging **4.** Data Phone Link Printout **5.** Automatic Checking **6.** Ground Checkout Systems **7.** Addressing **8.** Computer Output Printing **9.** Experimental Printing **10.** Computer Program Checkout

OPTIONS

Numeric or alphanumeric . . . Various data input interface circuits . . . Data storage with input gates . . . Zero suppression . . . Interchangeable code wheel . . . Expandable to 32 columns . . . Input data formatting for bit serial or character serial inputs . . . Table or console mounted . . . Fan-fold or roll paper . . . Inkless-impact sensitive paper . . . Two-part paper (original and copy) . . . Paper condition alarms . . . RFI provisioning . . . Acoustic silencing . . . Non-standard type fonts.

PERFORMANCE SPECIFICATIONS

Printing Speeds
- Numeric . . . up to 2400 lines per minute.
- Alphanumeric . . . up to 1200 lines per minute.

Column Capacity . . . up to 32 columns

Print Spacing
- Column . . . . . 10 columns per inch
- Line . . . . . 6 lines per inch

Printing Medium
- Inking . . . . . Long-life self-supplied inking roller
- Non-inking . . . 3M "ACTION PAPER"

Paper (both single or two part)
- Fan-folded . . . . . 1000 sheets of 3¾" x 8½" paper
- Roll . . . . . 4 inch diameter roll
- Weight . . . . . from 11 lb. sulphate bond to 125 lb. tab card stock

Power . . . . . 115/230 VAC, 47 to 63 cps., 300 watts max.

Number of Characters
- Numeric: 16 characters at 40 lps, asynchronous operation
- Alphanumeric: 48 characters at 20 lps

Input Codes . . . any binary character or BCD code

Manual Controls
- Off . . . . . power off
- Standby . . . power on but not printing (lamp indicator)
- Operate . . . . for printing on-line (lamp indicator)
- Paper Advance . . . Advances paper without printing

MECHANICAL INTERFACE SPECIFICATIONS

VARIOUS PACKAGE CONFIGURATIONS

The standard Series N Lister Printer is rack mounted. However, the machine and electronics can be table- or rack-mounted as shown (top photo right). The main frame of the Series N contains the printing mechanism and all the electronics except for the power supply. These various configurations are described as follows:

RACK MOUNTED

The Series N main frame is slide mounted in a standard 19-inch rack. It takes 12½ inches of panel height and 22 inches of depth, and weighs 75 pounds. The separate power supply is normally fixed-rack mounted just below the main frame, taking five inches of panel height and 18 inches of depth, and weighing 40 pounds.

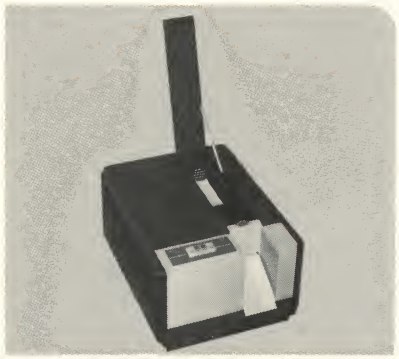
The printer and the power supply are connected with a six-foot cable.

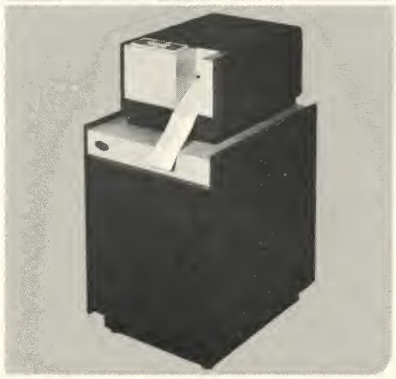
TABLE MOUNTED

The main frame is contained in a compact cabinet 12 inches high, 17 inches wide, 22 inches deep and weighing 70 pounds. A separate rack-mounted power supply, as described above, is connected to the main frame by a six-foot cable.

CONSOLE MOUNTED

In this version, the table mounted cabinet, containing the main frame, is mounted on a console which also accommodates the power supply and an additional 16 inches of rack space for data source circuits or paper storage. The console is 30 inches high, 21½ inches wide, 24 inches deep and, with the power supply, weighs 70 pounds.



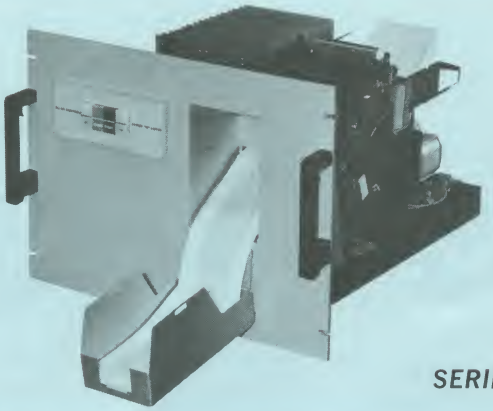


PRICE The price of the Series N Lister Printer ranges between $3000 and $10,000 depending on the number of columns and the options required.

di/an® **DI/AN CONTROLS INC.**

944 Dorchester Avenue, Boston, Massachusetts 02125, Phone: (617) 288-7700, TWX: 710-333-0174

PRINTED IN U.S.A.



SERIES N

SERIES DL

LISTER/PRINTER INTERFACE SPECIFICATIONS – SERIES N AND DL

ELECTRICAL INTERFACE

INTERFACE CIRCUIT ACCOMMODATIONS

The Lister/Printer interface circuit configuration provides a standard common control interface and a complete choice of standard data input circuits which will accommodate just about every conventional digital data source. All of the Lister/Printer circuits use silicon components and all components are registered or stock items. The outstanding compatibility with external data sources and the marked economy of a complementing inventory of standard interface circuits are salient features of the Series N and DL designs.

CONTROL INTERFACE CIRCUITS

The Control Interface Circuits shown below are standard and common to the Series N and DL Listers/Printers. Accompanying each equivalent circuit diagram are the basic specifications for that circuit. The remote column addressing option is not shown in this diagram; however, each column input requires an enabling signal of +6 volts for not less than two microseconds with a peak current of 20 milliamps.

DATA INPUT INTERFACE CIRCUITS

The Series N and DL Lister Printers offer a choice of one of four Data Input Interface Circuits (shown below) which will integrate with just about any logic circuit available. These circuits are all single ended and can accept either positive or negative TRUE inputs. The availability of these circuits is based on whether or not optional line storage is purchased with the Lister/Printer.

DATA INPUT CIRCUIT A — This is the standard positive-level input circuit available without line storage, and is not available with optional line storage.

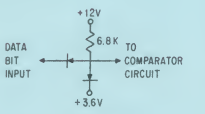
DATA INPUT CIRCUIT B — This is a positive-level amplified circuit which is optional without line storage and standard with line storage.

DATA INPUT CIRCUIT C — This is the negative-level circuit counterpart of Interface B.

DATA INPUT CIRCUIT D — This circuit offers a high resistance input to negative levels and is available only with storage as a standard item.

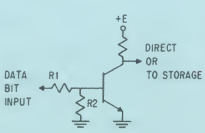
DATA INPUT INTERFACE CIRCUITS

- +4V TO +30V (HIGH)
- 0V TO +1V (LOW)
- EITHER LOGIC PHASE MAY BE SPECIFIED AS "1".
- CURRENT ABSORBED BY SOURCE: 7MA AT 0V.



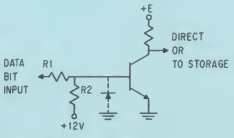
INTERFACE "A" STANDARD POSITIVE INPUT

- 0=1V=LOW
- +3,+6 OR +12 VOLTS=HIGH.
- EITHER LOGIC PHASE MAY BE SPECIFIED AS "1".
- CURRENT=FROM 2 TO 3 MA AT POSITIVE LEVELS.



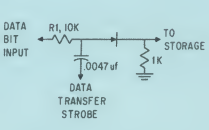
INTERFACE "B" AMPLIFIED POSITIVE INPUT

- 0=1V=LOW.
- -3,-6 OR -12 VOLTS=HIGH.
- EITHER LOGIC PHASE MAY BE SPECIFIED AS "1".
- CURRENT=FROM 1.6 TO 3.4 MA AT NEGATIVE LEVELS.
- CURRENT=FROM 0.25 TO 1.5 MA AT 0 VOLT LEVEL.



INTERFACE "C" AMPLIFIED NEGATIVE INPUT

- 0 TO -15V=LOW
- -5V AND UP=HIGH
- EITHER LEVEL MAY BE SPECIFIED AS "1".
- GATE SETTLING TIME = $3(R_{GEN} + 10{,}000) \times .0047\text{us}$ WHERE R_{GEN} = SOURCE RESISTANCE.
- DATA MUST BE HELD STEADY FOR THIS INTERVAL BEFORE APPLYING PRINT COMMAND.



INTERFACE "D" HIGH RESISTANCE NEGATIVE INPUT

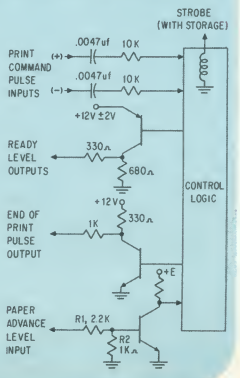
CONTROL INTERFACE CIRCUITS
(COMMON TO ALL DATA INPUT INTERFACE)

PRINT COMMAND PULSE
- PULSE OR STEP (POSITIVE OR NEGATIVE) OF A 4V MIN. AMPLITUDE AT ANY DC REFERENCE UP TO ±50V.
- TRANSIENT LOAD 10K IN SERIES WITH .0047uf TO GROUND (MAX)
- RISE TIME, 2us (MAX)

READY LEVEL
- READY=+12V ±2V, 330Ω SOURCE
- HOLD DATA=0V, 1K SOURCE
- RISE TIME, UNLOADED, 2us (MAX)

END OF PRINT PULSE
- FROM 0V AT 1K TO 9V AT 1.33K
- DURATION=780us
- RISE TIME=40us (MAX)

PAPER ADVANCE LEVEL
- 0 ±1V=OFF
- +6 TO +12V=ON
- 5MA DRAIN WHILE "ON" AT +12V



UNPRECEDENTED FLEXIBILITY

Never before have high-speed printers been offered with so complete and so wide a range of complementing pre-designed, logical interface options. The Series N and DL Lister/Printers offer the systems engineer a virtually unlimited choice of format, capacity, and control sequence. Also, these Lister/Printers can be optionally arranged to accommodate any conventional source of data and control program, regardless of the specific circuit design, provided that the printer is not required to operate outside its wide-range performance ratings.

INPUT DATA ORGANIZATION

As the Series N and DL Lister Printers are basically parallel machines, data is normally entered bit-parallel or character-parallel. However, character-serial or word-serial entry can be facilitated by purchasing the line storage and remote column addressing options. With these options the customer can buss together the input data lines and sequentially enable the remote column addressing inputs (with a commutator) in order to enter into parallel line storage characters that are serially placed on the data buss.

CONTROL SCHEMES

As shown in the Timing Diagram, the Series N and DL Lister Printers can be controlled either synchronously or asynchronously. In the synchronous mode of control, the printer acts as a systems clock, generating END OF PRINT pulses which control the data source. This pulse tells the data source that it has just so much time (from T_1 to T_2) to enter new data for printout in the next line. In the asynchronous mode of control, where the data source controls the printer, the printer accepts a PRINT COMMAND pulse from the data source while issuing a READY LEVEL signal. When the READY LEVEL is in the READY state, it remains there until a PRINT COMMAND is issued. When the data source is settled on the next line to be printed, it issues a PRINT COMMAND which pulls the READY LEVEL to the HOLD DATA state (50 microseconds after the forward edge of the PRINT COMMAND pulse). The READY LEVEL remains in the HOLD DATA state until the completion of printing whereupon the READY LEVEL is restored to the READY state. Any PRINT COMMANDS that are issued when the READY LEVEL is in the HOLD DATA state are ignored. The PAPER ADVANCE input allows the paper to be stepped at the machine rate without printing. This provides for formatting of the printout or automatic viewing of the last printed line.

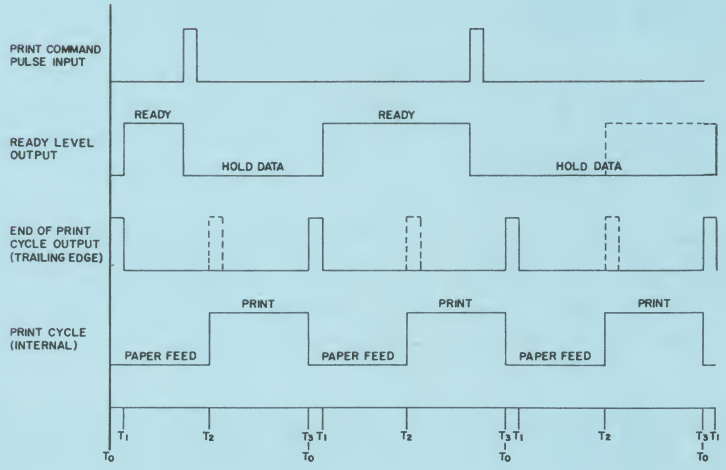
INPUT DATA TIMING

When the asynchronous numeric type-drum is used, data can be presented to the Lister/Printer without regard to the READY LEVEL timing reference, providing new data is not entered at a rate exceeding the print rate of the Lister/Printer. In this case, the PRINT and PAPER FEED phases of the print cycle (T_0 to T_3) are complementary. When other numeric or alphanumeric type-drums are used, the entry of new data must be done between T_1 and T_2 in order to realize the maximum printing speeds of the Lister/Printer. If the Lister/Printer does not have optional line storage, new input data must be settled at the source before a PRINT COMMAND is issued, and the data must be held during the entire period in which the READY LEVEL is in the HOLD DATA state. If optional line storage is provided, new input data must only be steady for two microseconds commencing with the rise of the PRINT COMMAND, after which the data source can be released.

INPUT CODES

Because the Series N and DL use an optical shaft encoder, rather than electronic counting, it can handle any binary character code up to 6 bits, positive or negative TRUE. If the data source operates with different character codes, separate and interchangeable code wheels can be supplied.

SYSTEM TIMING



NOTE: (----) INDICATES OPERATION WITH ASYNCHRONOUS TYPE DRUM

TIME LEDGER

TYPE OF PRINTER				TIME FROM T_0 IN MILLISECONDS		
LPS	CHARACTERS	RPM	FIELDS	T_1	T_2	T_3
40	14 – NUMERIC	1200	2	.78	14	25
20	16 – NUMERIC	1200	1	.78	37.5	50
20	16 – NUMERIC	600	2	1.56	25	50
10	16 – NUMERIC	600	1	1.56	75	100
20	48 – A/N	1200	1	.78	12.5	50

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